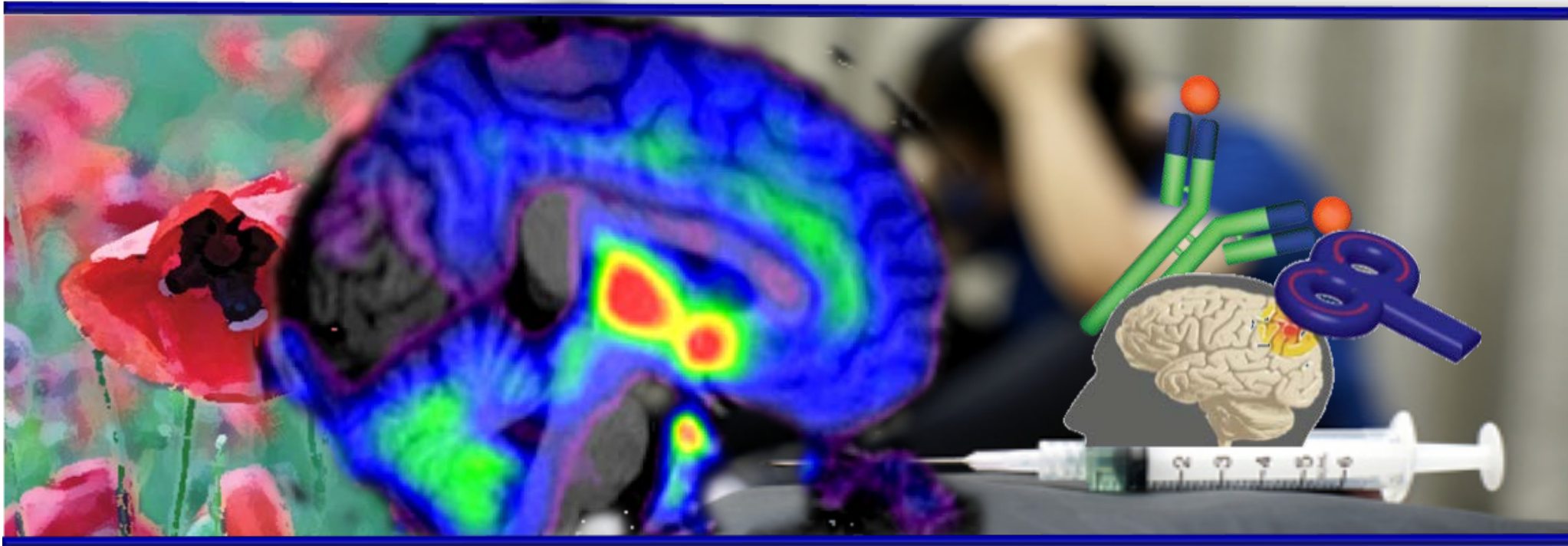


# The Opioid Epidemic:

## *How, Where, and What Can Be Done?*



Nora D. Volkow, M.D.  
Director

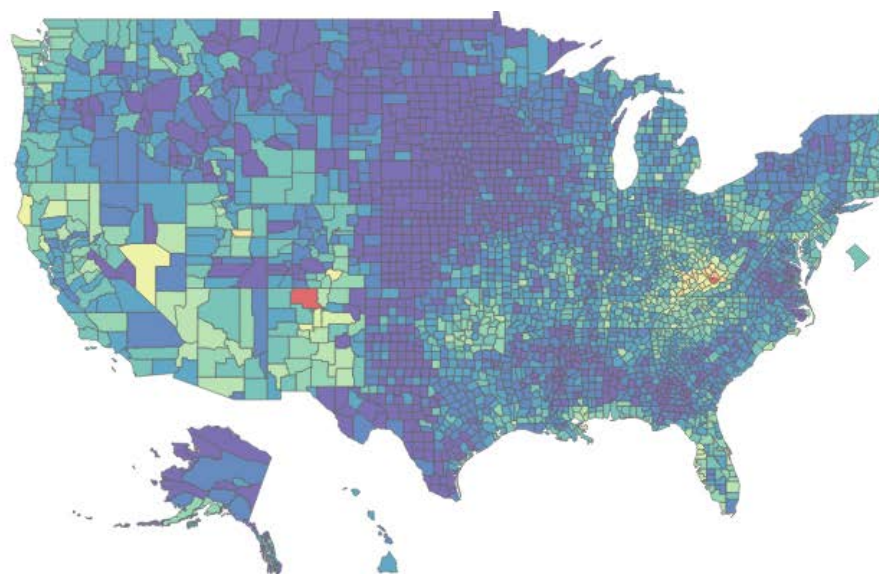


National Institute  
on Drug Abuse

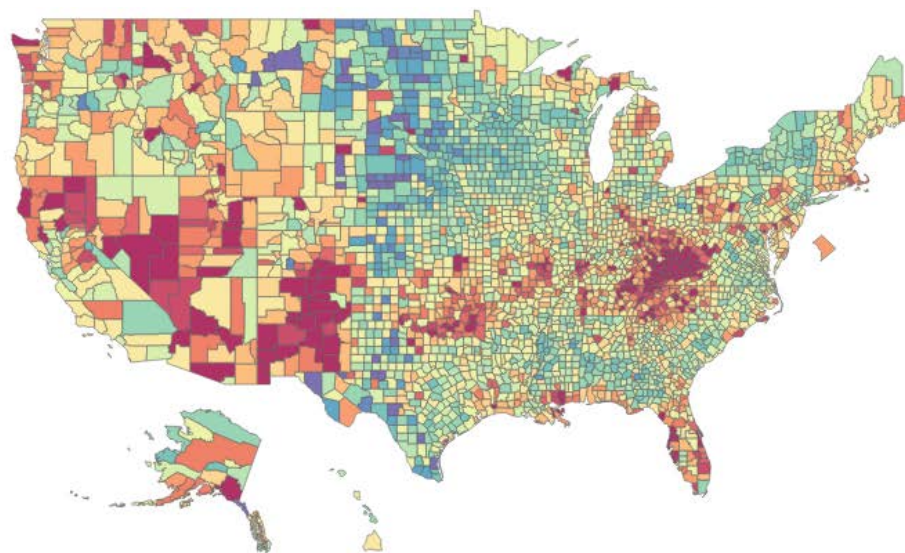
 @NIDAnews

# Overdose Death Rates

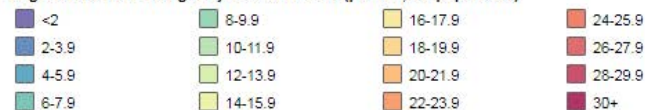
*1999*



*2016*

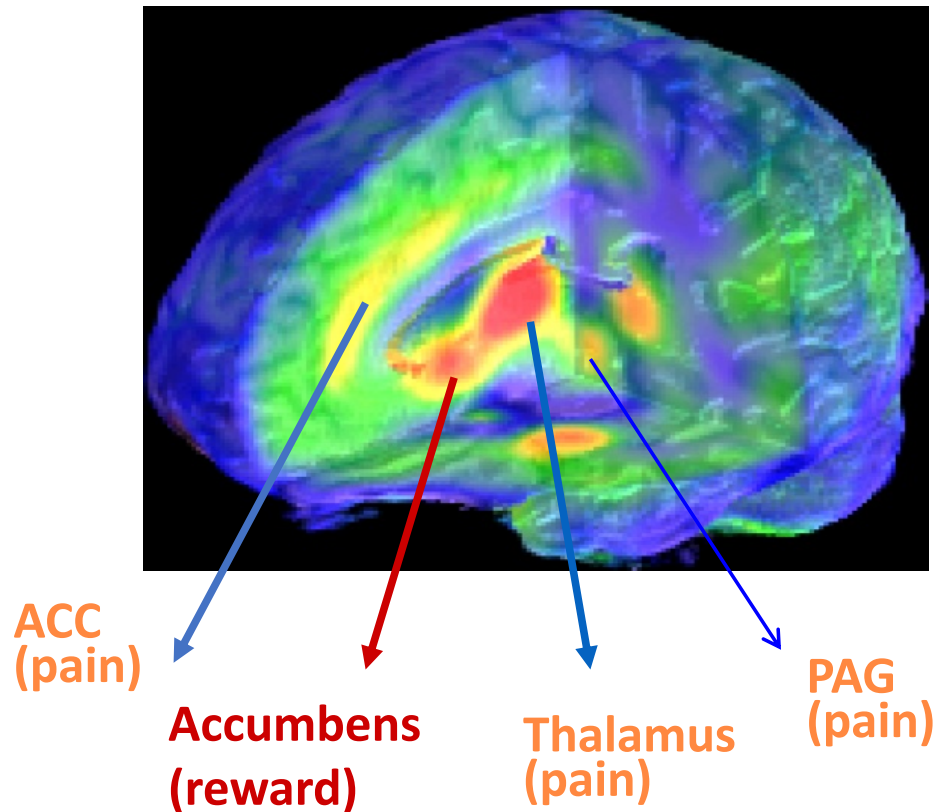


Legend for estimated age-adjusted death rate (per 100,000 population)



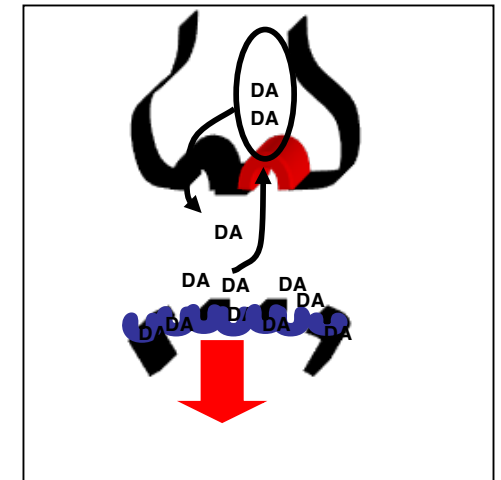
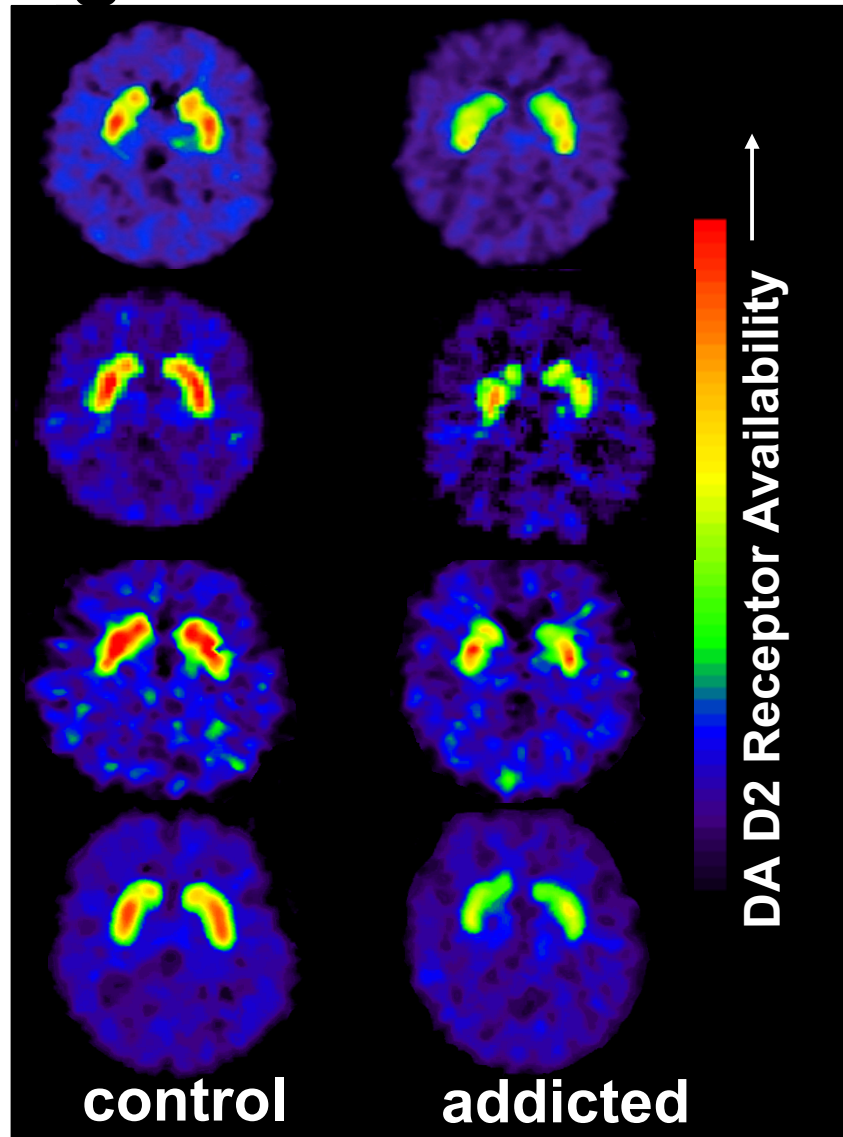
Source: <https://www.cdc.gov/nchs/data-visualization/drug-poisoning-mortality/index.htm>

# Analgesic & **Reward** Mechanisms of Mu Opiate Drugs (Heroin, Vicodin, Morphine)

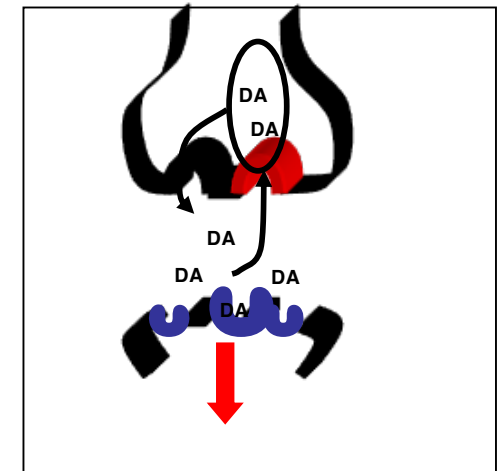




# Decreased Levels of DA D2 Receptors in Drug Addicted Individuals



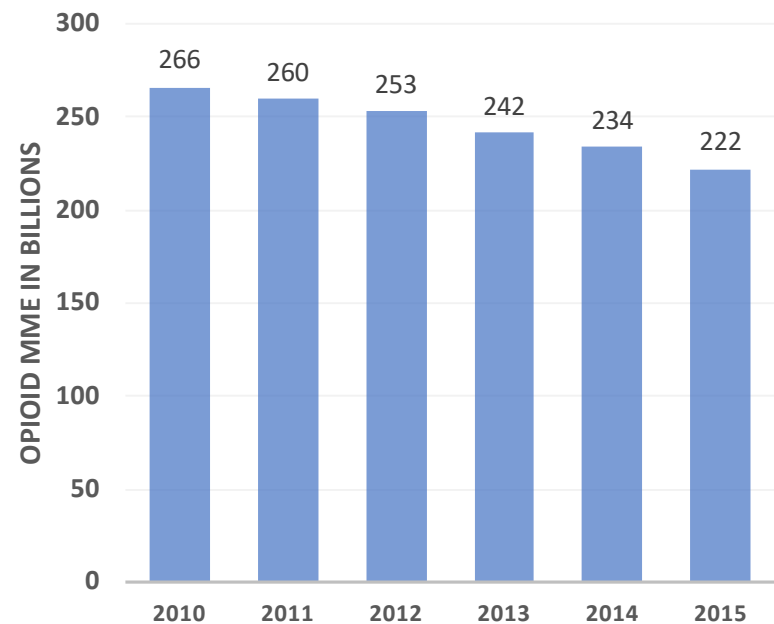
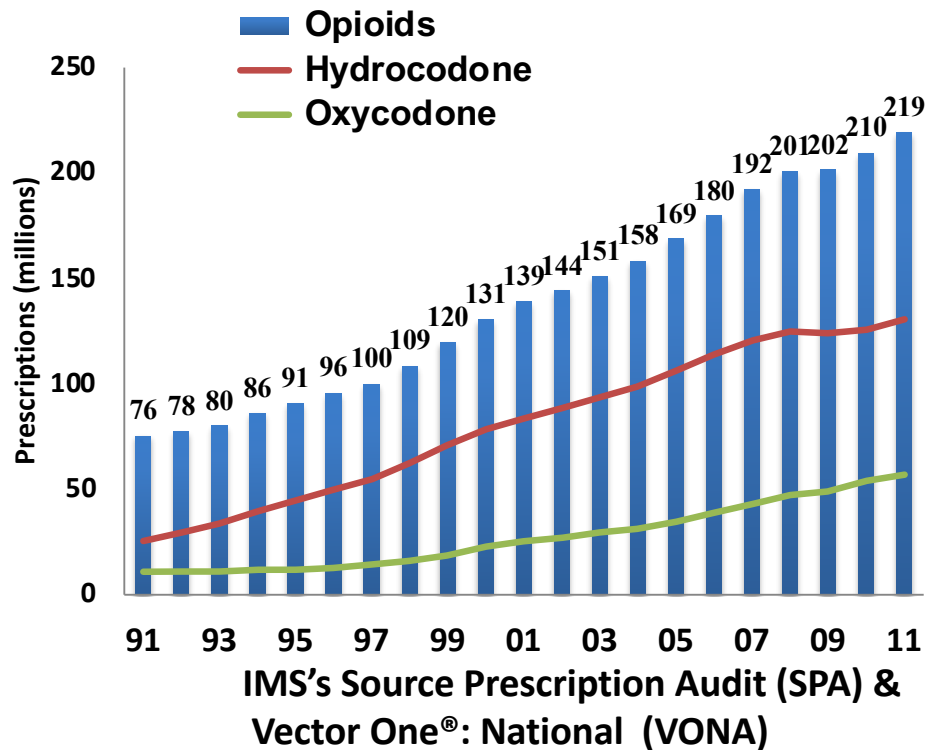
*Non-Drug Abuser*



*Drug Abuser*  
Volkow et al., PNAS 2011

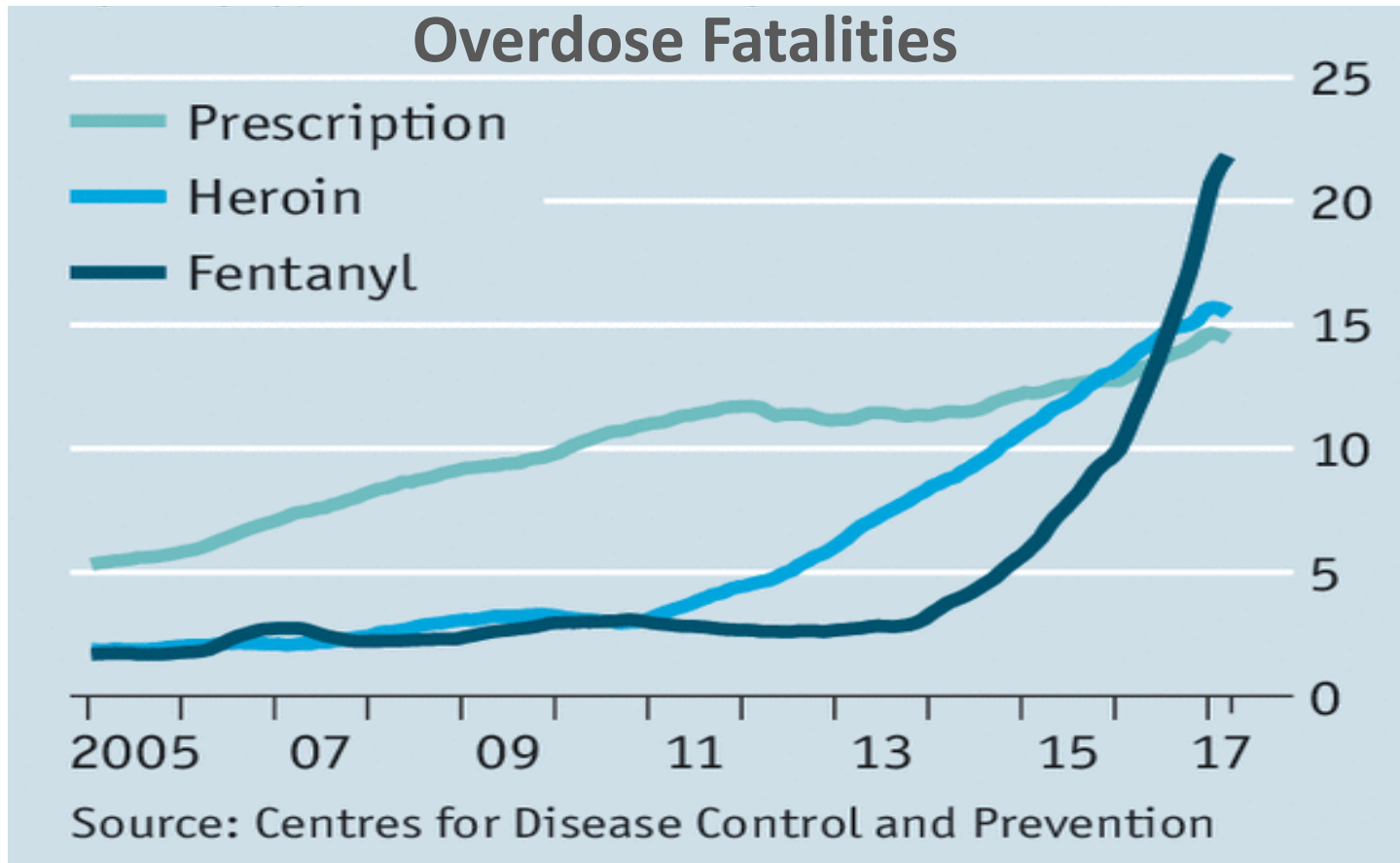
# Opioid Prescriptions 1991-2011

***Opioid morphine milligram  
equivalents (MME)  
dispensed fell by over 15%  
from 2010-2015***



***IMS Health, U.S. Outpatient Retail Setting***

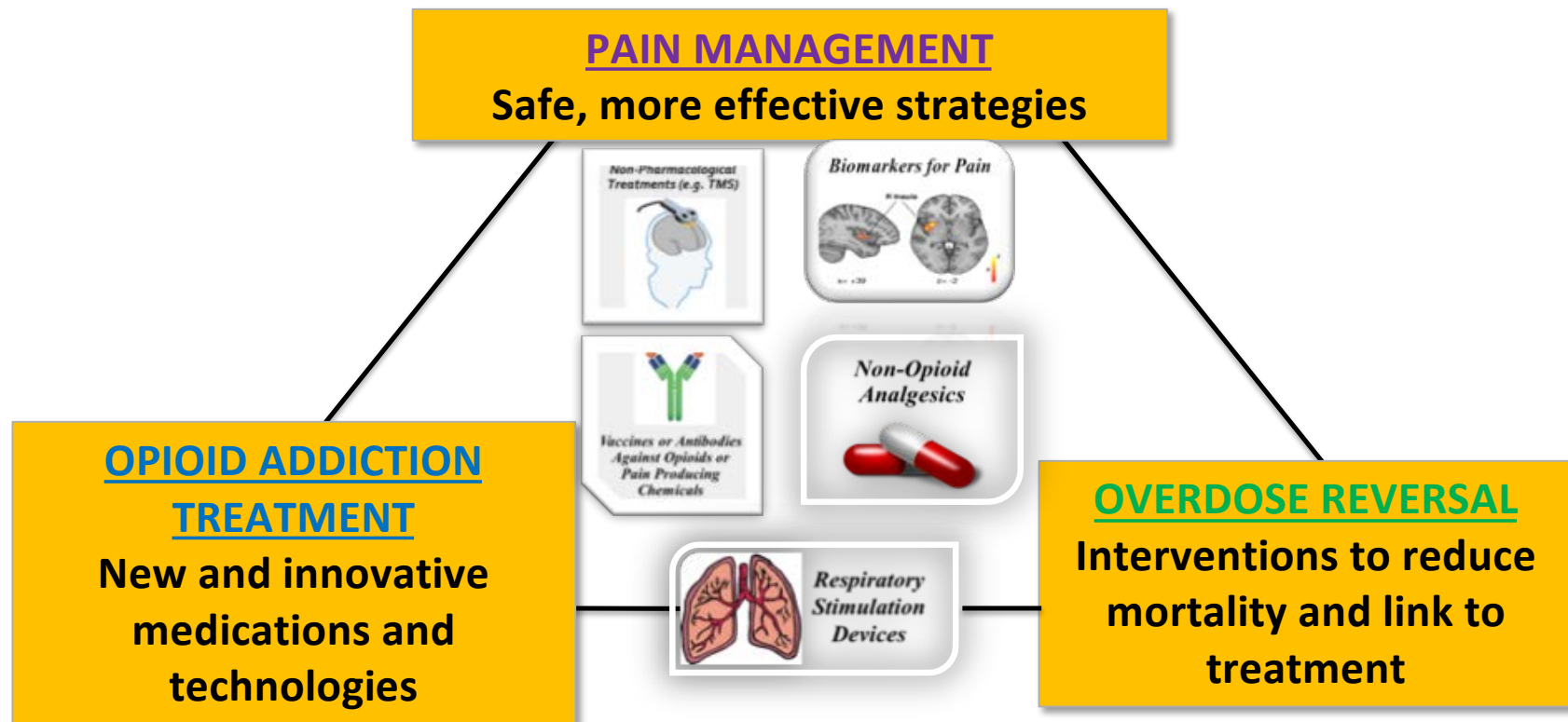
# Evolution of the Opioid Crisis



1. Over prescription of opioid medications led to misuse
2. Addiction to prescription opioids led to heroin
3. Emergence of fentanyl(s), with higher potency and greater profitability in the black market than heroin.

# NIH OPIOID RESEARCH INITIATIVE

## Using Research to End the Opioid Crisis



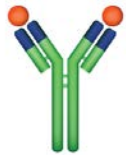
# Safe, More Effective Strategies for Pain Management



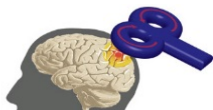
**Non-Opioid Analgesics**  
Cannabinoids;  
Inflammatory mediators;  
Ion channel blockers



**Targeted Opioid Analgesics**  
with reduced potential for  
addiction and overdose

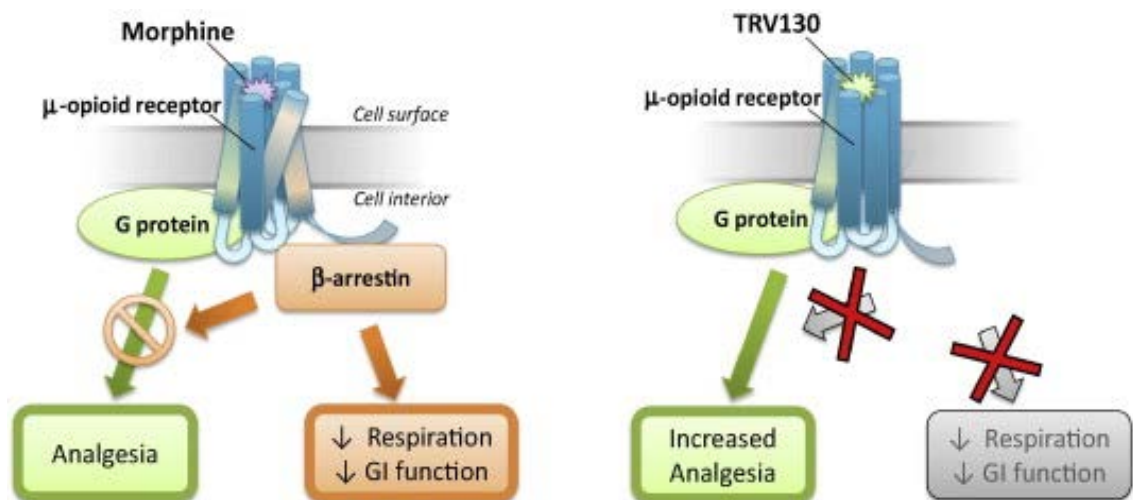


**Biologics**  
e.g. antibodies that bind to  
pain producing cytokines



**Non-pharmacological treatment**  
Neural stimulation;  
Surgical interventions;  
Meditation

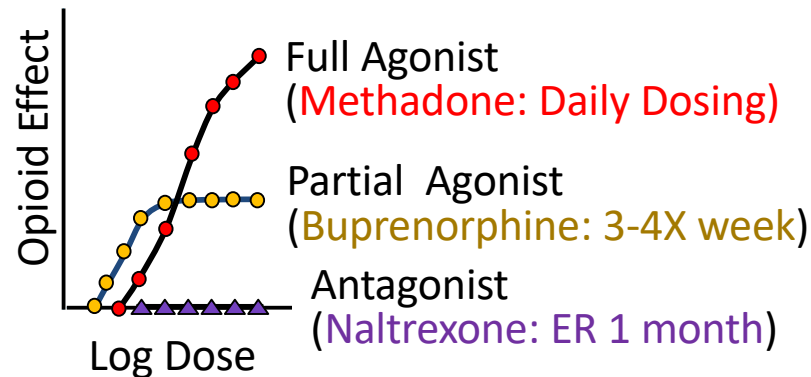
## ***Biased Mu-Opioid Receptor Ligands: New Generation Of Pain Therapeutics***



Soergel DG et al., *Pain* 2014; 155(9):1829–1835.



## Medication Assisted Treatment (MAT)



### DECREASES:

- Opioid use
- Opioid-related overdose deaths
- Criminal activity
- Infectious disease transmission

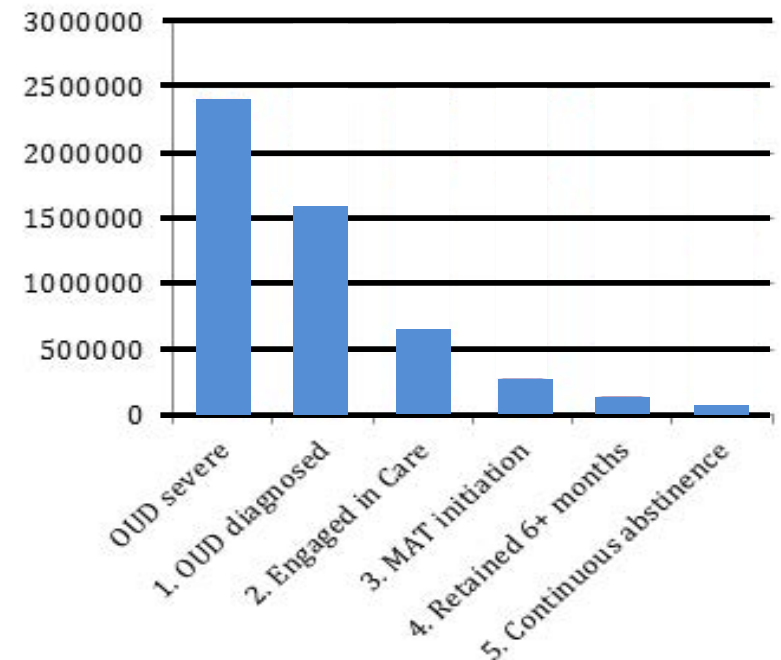
### INCREASES

- Social functioning
- Retention in treatment

**MAT is highly underutilized!**

**Relapse rates are very high (50% in 6 months)**

## OUD Cascade of Care in USA



*Williams AR, Nunes E, Olfson M. Health Affairs Blog, 2017*

Expand access to MAT

Healthcare system

Criminal Justice system

**Medication development**

**Extended release formulations**

**Drug combinations**

**New Targets, Vaccines others**

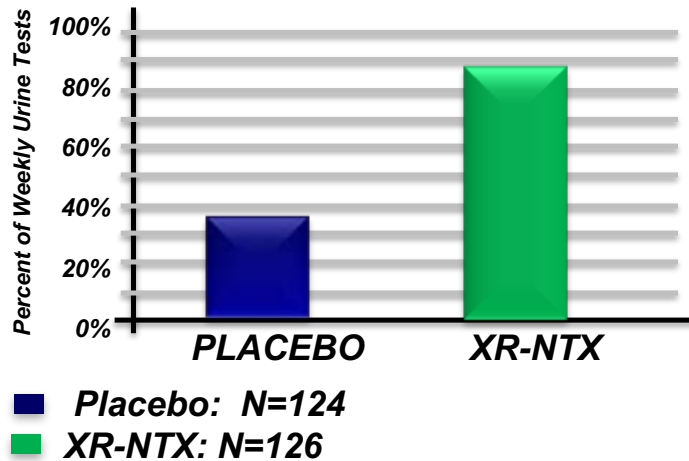
# Extended Release Formulations

- **Vivitrol®**



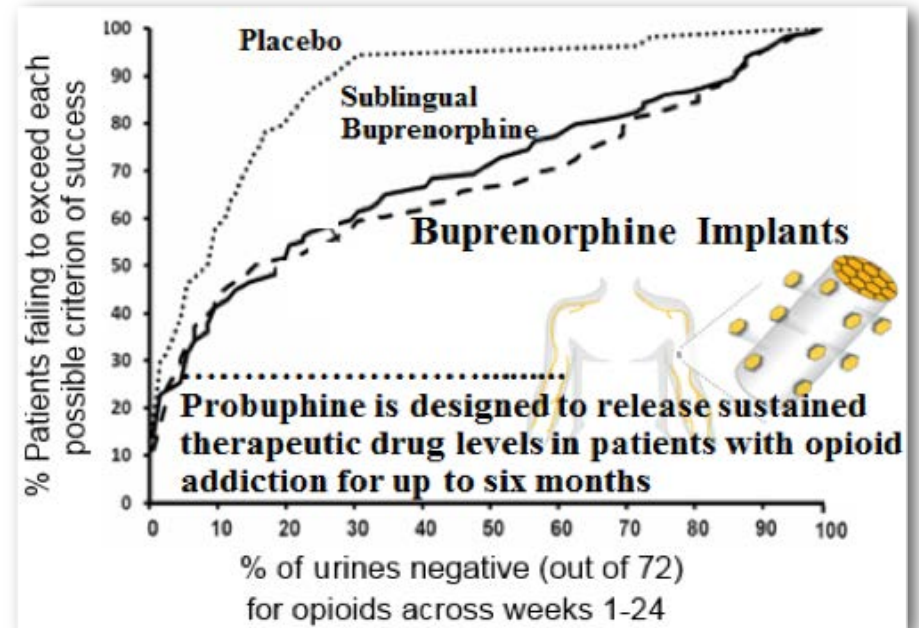
**IM Injection q 4 weeks for 24 weeks**

*Median % Opioid-Negative Urines*



*Krupitzky et al., Lancet 2011*

- **PROBUPHINE®**



*Rosenthal et al., Addiction 2013;105.*

**FDA approval – May 26, 2016**

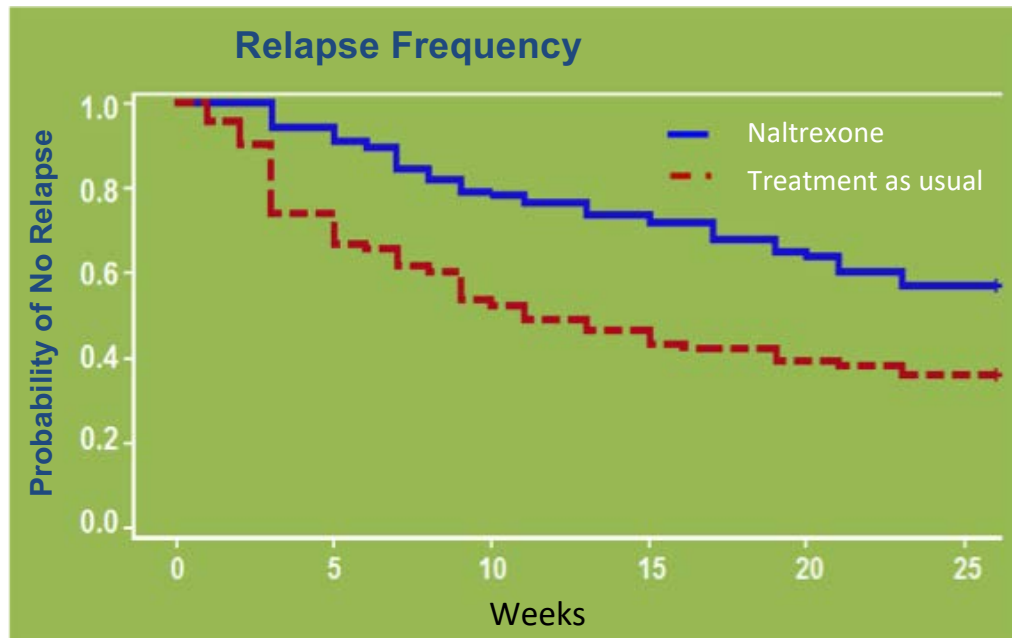
**Opportunities for Partnership in the Development of Longer Acting Formulations and/or Drug Combinations to Improve Treatment Compliance and Retention**

# Improving Treatments for Addiction:

## *Naltrexone Trial in CJ Populations*



- *Participants:* parolees/probationers with opioid addiction – all *volunteers* – received either
  - Monthly injections of extended release naltrexone for 6 months
  - Community treatment, including methadone or Suboxone (encouraged)



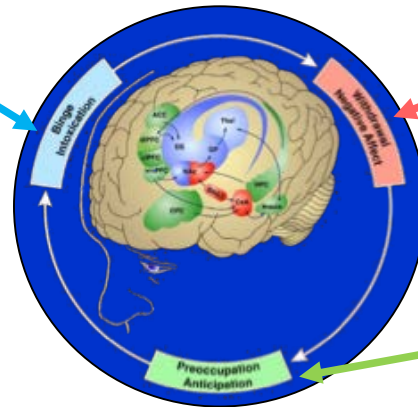
Overdoses in 78 weeks:

Control: 7  
Naltrexone: 0

*Lee et al. NEJM March 31, 2016.*

# ***Target Selection on the Basis of the Neurocircuitry of Addiction***

***Targets to interfere with drug reward***



***Targets to reduce stress-induced drug seeking and to improve mood***

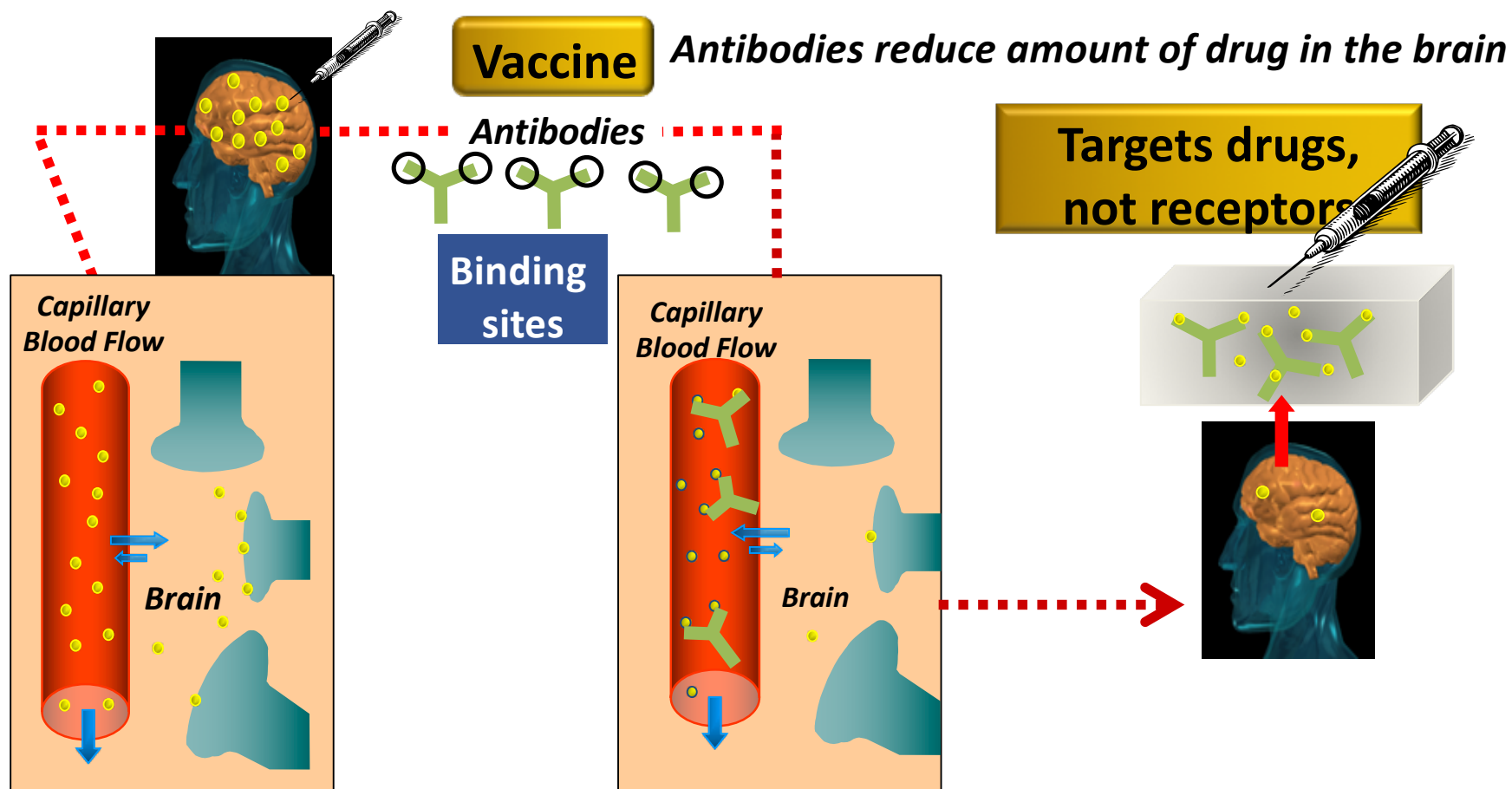
***Targets to reduce cue-induced drug seeking and to improve executive function***

***Diagram: Koob GF, Volkow ND.  
Neuropsychopharmacol Rev, 2010***

***Compounds targeted to neurocircuitry could be beneficial not just to addiction but also to diseases for which such circuits are disrupted (i.e., ADHD, depression)***



# Immunotherapies for Opioid Use Disorder



Hwang et al., Efficacious Vaccine against Heroin Contaminated with Fentanyl. ACS Chem. Neurosci. 2018

**Expand access to MAT**

**Healthcare system**

**Criminal Justice system**

**Medication development**

**Extended release formulations**

**Drug combinations**

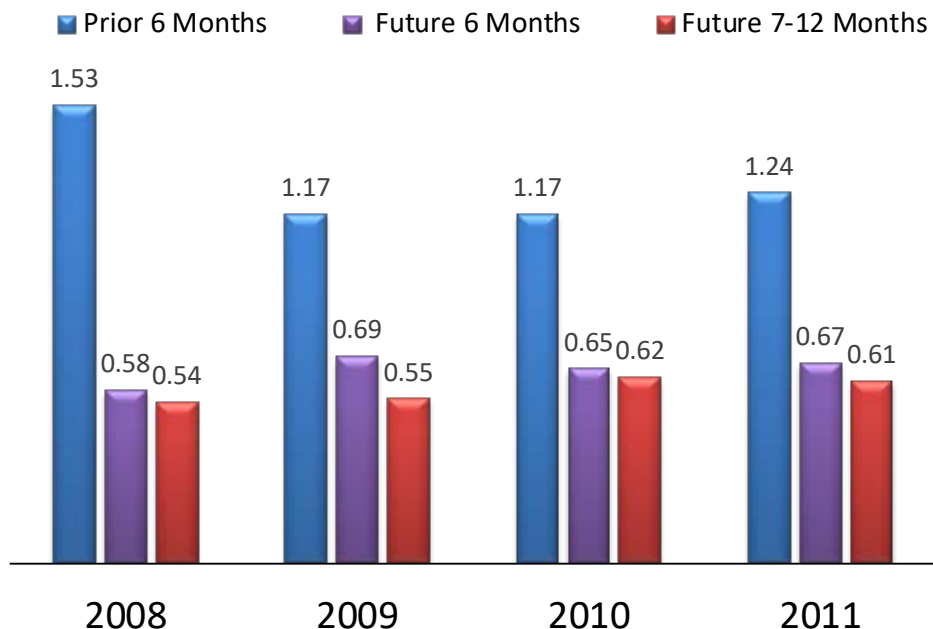
**New Targets, Vaccines others**

# The “Massachusetts Model” of Office Based Opioid Treatment (OBOT) with Buprenorphine



Collaborative care between nurse care managers and generalist physicians

## ER Admissions per OBOT Enrollment



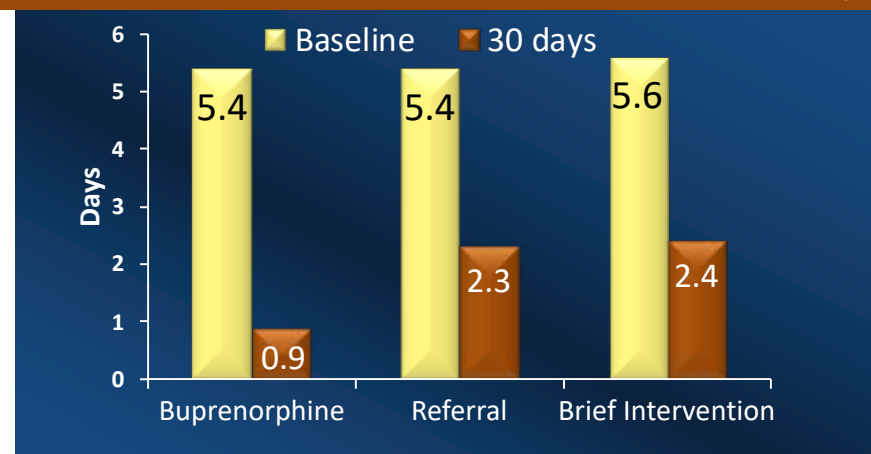
Source: Office of Data Analytics and Decision Support, Bureau of Substance Abuse Services, MA Department of Public Health. 2014.

## Implementing Buprenorphine Treatment in ED



- Reduced self-reported, illicit opioid use
- Increased engagement in addiction treatment; decreased use of inpatient addiction treatment services

## Self-Reported Illicit Opioid Use in the Past 7 Days



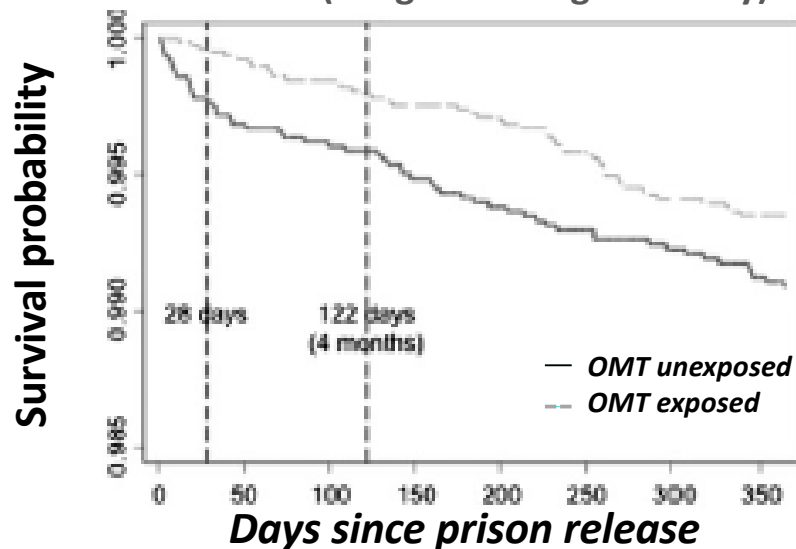
D’Onofrio G et al., JAMA April 28, 2015.



## Opioid Medication Therapy (OMT) In Prison

### Mortality Post Release

Survival Curve During the Year Following Release (Drug-Poisoning Mortality)

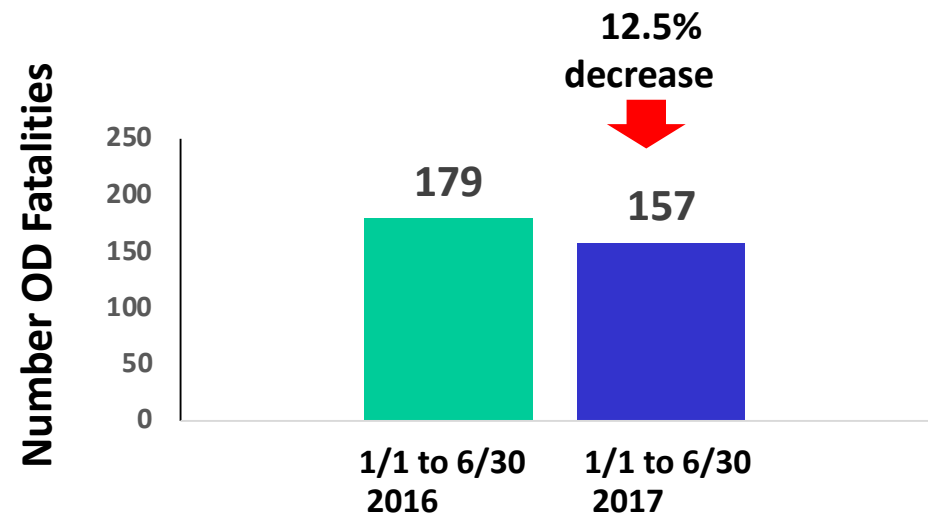


OMT resulted in a 75% reduction in mortality (85% reduction in overdoses) in the first month post release

*Marsden J et al., Addiction 2017; 112:1408-1418.*

## Postincarceration Overdose Deaths After Implementing OMT in a Statewide Correctional System (Rhode Island)

### Statewide Overdose Deaths



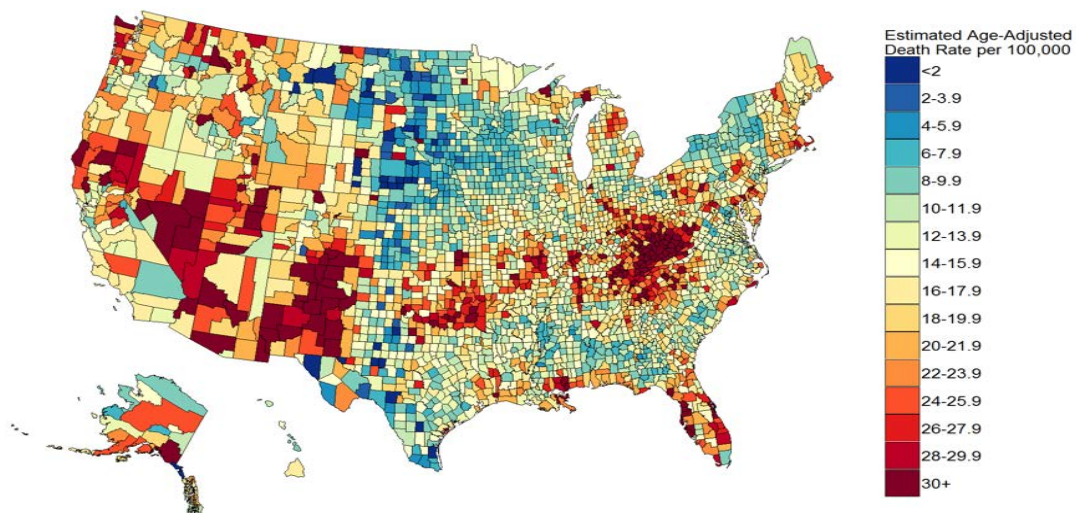
OD fatalities in those who had been incarcerated in 2017 decreased by 60% compared to 2016 (5.7% vs 14.5%)

*Green TC and Clarke J. JAMA Psychiatry 2018;75(4).*

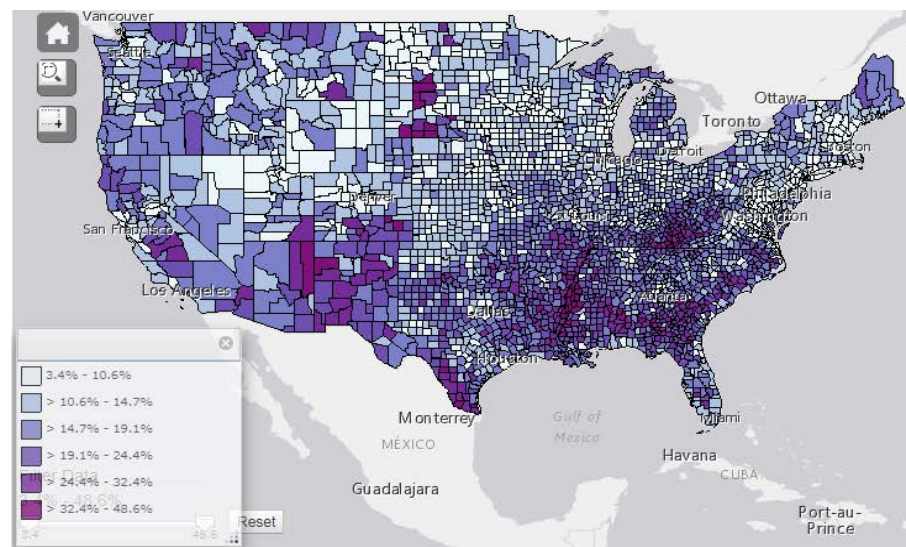
# Drug Poisoning Deaths

2016

2016



# All Ages in Poverty



Source: CDC NCHS, census.gov





# Education

## PAIN

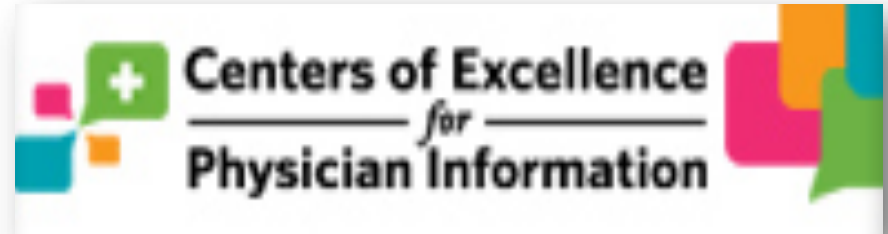
### *NIH Pain Consortium Centers of Excellence in Pain Education*

ORWH NIA  
OBSSR NINR  
NIDA NICHD  
NIDCR NIAMS  
NINDS NCCIH



**Goal:**  
*Improve pain treatment through education*

## SUD



**Goal:**  
*Prevent SUD and improve outcomes in addiction through education of health care providers*

